The City of Lynchburg, Virginia

Information Technology

Strategic Plan

FY 2001

Prepared by:
The Office of Information Technology
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SECTION 1 -- INTRODUCTION

1.1 Overview

Technology is becoming an ever-increasing enabler for the City of Lynchburg to serve its citizens and achieve its vision. A growing number of existing services are dependent upon technology for their delivery and availability. Just as important, new technology applications, architectures, components, and systems are being introduced at a rapid pace, which allow for new and better solutions and service delivery processes. This increasing dependence on technology, and the required resources it consumes, drives the need for coordination and planning.

This document -- a technology strategic plan -- is a combined description of the City departments' desired initiatives and the information technologies that are required to help them be successful. This plan summarizes: the vision of the City and how technology trends are influencing the delivery of governmental services (Section 2), the management principles and processes of the City's technology resources (Section 3), the technology initiatives across the City (Section 4), and the City's technology architecture (Section 5).

The City's technology direction is derived from the business requirements of the City's departments for the services they provide. Like businesses, City departments are being driven to improve service delivery by enhancing functionality, reducing costs, increasing responsiveness, improving productivity, and expanding customer service. They are being driven to think in an entrepreneurial manner. Technology is a tool to help address these requirements; however, each application of technology must be evaluated for its cost-benefit, and each must be applied in a coordinated way across City operations in order to achieve the maximum cost-benefit. The true value of this technology plan is in the alignment and coordination of technology initiatives across all City departments.

1.2 Scope of this Plan

This strategic plan has a five-year planning horizon. It is an accumulation of the views of the City's seven strategic areas (Business Systems, Community Planning and Development, Economic Development, Fire, Human Services, Police and Public Works) and the technology staff on where and how technology should be applied to help enable the City to reach its vision. Given the rapid rate of change in technology alternatives, it is extremely difficult to foresee five years into the future. Consequently, more emphasis is placed on describing the desired directions and outcomes versus the technologies to be used. Also, initiatives and desired outcomes have been documented regardless of whether funding has been secured or support resources obtained. The intent of this document is to describe

a desired technology direction to guide business improvements, systems integration, and technology infrastructure enhancements.

It should be noted that this plan is limited in scope to operations within the City of Lynchburg's departments. Although regionalism is desired and evidenced in many areas, such as the Regional Radio System, the planning for such regional solutions is not the focus of this document. Likewise, although several external entities influence and impact the City's technology direction, such as interfaces to State and other agencies, the focus of this plan is on technology that is implemented and supported by the City.

SECTION 2 -- STRATEGIC OVERVIEW

2.1 City Council Vision

In the fall of 2000, Lynchburg City Council refined its vision for the City of Lynchburg for the year 2020. This vision provides a shared picture of the desired future for the City. In part, the vision reads:

> *Working together, we will be a progressive community shaped by new ideas and solutions, a skilled and innovative workforce, and citizen leadership -- all distinguished by responsible and traditional values, involvement, education, new technology, and quality citizen services.*

The City Council also refined its vision principles to guide decision-making and to provide direction to City administration in the strategic planning process and in the execution of stated objectives. These principles are:

1. *Act in a manner that is trustworthy, helpful, courteous, thrifty, and courageous.*
2. *Pursue efficient and effective use of all resources.*
3. *Ensure accountability for results.*
4. *Be responsive to citizens and engage the community.*
5. *Cooperate and collaborate across internal, political, geographic, and public/private boundaries.*
6. *Look to the future and explore new and more efficient ways to meet the needs of the community.*
7. *Seek out and address root causes of problems and issues.*

Information technology is frequently a tool used to ensure alignment of work objectives with these principles, especially the principles to pursue efficient and effective use of resources and to be responsive to citizens. These principles and the City Council's commitment to the use of technology to achieve its vision provide the foundation and direction for this technology strategic plan for the City of Lynchburg.

2.2 Lynchburg 2020 Strategic Plan

The Strategic Leadership Team (SLT) is composed of the City Manager, two Deputy City Managers and Directors from the seven strategic areas of Business, Systems, Community Planning and Development, Economic Development, Fire, Human Services, Police and Public Works. The SLT is responsible for developing and executing the City's annual Strategic Plan.

In January 2000, the Lynchburg City Council endorsed the City's annual Strategic Plan, as presented by the SLT. The five major Focus Areas identified in City Council's Vision were used to establish goals. The five major Focus Areas are:

- *Stable, Productive, Inspired Families*
- *Dynamic Economic Development Center*
- *A Superior Education Community*
- *A Community Environment Second-to-None*
- *Responsive, Effective Local Government.*

In a revision to the Strategic Plan in July 2000, twenty-eight strategic goals were identified by the SLT to address the five Focus Areas. These goals guided the development of the City's Organizational Work Plan in July 2000, which provides detailed short-term and long-term objectives and timeframes for each goal. The Organizational Work Plan will be revised as part of City Council's annual process of goal setting conducted each fall. The goal setting process for FY2001 - 02 is in progress at the time of publishing this technology plan. These goals and objectives establish the highest priorities for the deployment of technology and are central to the planning processes for future technology enhancements.

2.3 Technology Trends

Technology is changing at an accelerating pace. Likewise, the requirements of operating departments are expanding in a similar fashion. The ongoing evaluation of emerging technology is a necessity to aid these departments in successfully delivering their services and to move the City forward toward achieving City Council's vision. Some emerging trends that are expected to influence the direction of technology deployed in the City include:

- **Internet Technologies --** Interconnected networks of application servers and databases. The advent of network computing and of standards-based interconnection of disparate systems has allowed for open, ready access to systems and databases worldwide.
- **E-Government --** The delivery of government services to consumers using electronic technologies, primarily internet technologies. This service delivery mechanism is driving radical changes to service delivery processes, often with an emphasis of providing services at any time, from any place.
- **Mobile Computing --** The use of portable digital devices, such as laptop personal computers, digital phones, and personal digital assistants, to access data or to communicate with people from wherever they are. The use of wireless data communications technologies is also enabling real-time access to many data services, such as work order processing, banking, email, and many internet-based services.

- **Increased Bandwidth Requirements --** The need for increasing amounts of data communications capacity. Many of the trends listed above require an ever-increasing amount of data to be transferred for the specific service to be provided. The transmission of graphical images and the convergence of voice, video, and data systems are driving this trend. As a result, fiber-optic or other high-speed transmission technologies are a requirement for service delivery.
- **Data Integration --** The combination and presentation of data from multiple sources to be used for decision support and to enhance the information's usefulness. Examples include presenting maps along with text information or presenting a consolidated view of accounts receivable for one entity. In combination with the trend toward network computing, the demands are increasing to tie together the data from independent systems and databases.

SECTION 3 -- INFORMATION TECHNOLOGY MANAGEMENT PROCESSES AND PRINCIPLES

3.1 Mission

The mission of the Department of Information Technology (DIT) is *"To develop and maintain technology solutions to enable internal and external clients to be successful in the delivery of their services."*

DIT operates in a consultative and collaborative manner partnering with its customers to understand their business needs and to devise technological solutions that will aid in resolving their business problems. Technology is an enabler, providing tools and solutions to assist the City's departments in successfully performing their core business functions.

3.2 Information Technology Services

The Department of Information Technology serves all City departments for their information technology needs. The core services provided include:

SERVICE	*STAFFING*	*DESCRIPTION*
Application Design & Programming	8	The analysis, design, and development or acquisition of business application solutions
Application Support		The operational support to end-users for business applications
Computer Operations	3	The operation of the City's data center computers and associated equipment
Network Engineering Support	1	The analysis, design and implementation of efficient, reliable, cost effective networks
Local Area & Wide Area Network Support	3	The operation, maintenance, and enhancement of the City's local area and wide area networks
Internet, Email, and Remote Access Support		The operation, maintenance, and enhancement of the City's web, Lotus Notes, and remote access platforms
Personal Computer Support	4	The end-user support for personal computers and associated standard office automation software
Voice Systems Support	0	The maintenance, enhancement, and end-user support of the City's central telephone and voice mail systems

Although some City departments maintain technology support staffs, the above services are offered to all City departments to provide the tools and functionality they need to effectively serve citizens and to efficiently perform operations. DIT

also provides network and Internet services to the City school system and to the locally supported constitutional offices.

3.3 Management Processes, Structure, and Teams

3.3.1 Technology Services Process Model

The Department of Information Technology is a service organization performing service processes. The structure of the DIT organization is based upon a process focus. At the highest level, the core processes performed are:

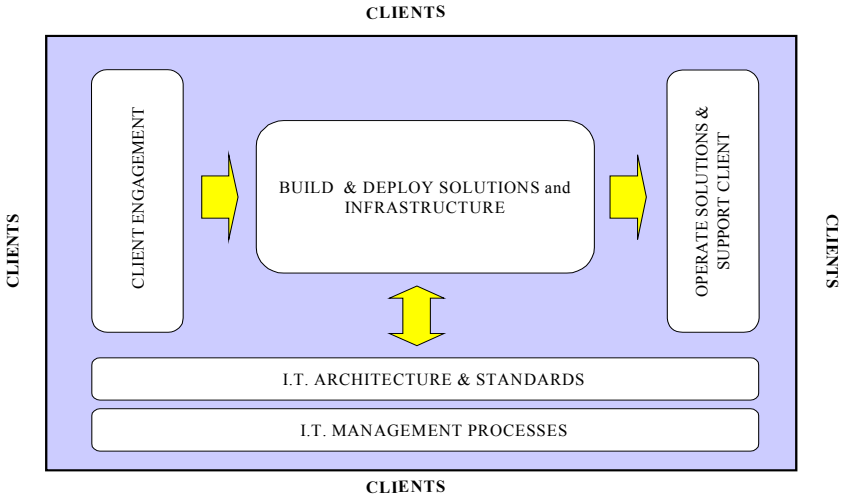
- Engaging client organizations to understand their requirements;
- Developing and deploying technology solutions based on those requirements;
- Operating and supporting the solutions once they are deployed.

Additional processes are performed to define information technology standards and architectures. These standards and architectures, in addition to clients' business requirements, drive the creation of the information technology infrastructure. The infrastructure itself is built using the same core processes as those used to build, test, and deploy client solutions.

The following diagram provides a conceptual model for describing these DIT processes.

Structure for Delivery of I.T. Services

Information Technology
Process & Management System Model



3.3.2 Structure for Delivery of DIT Services

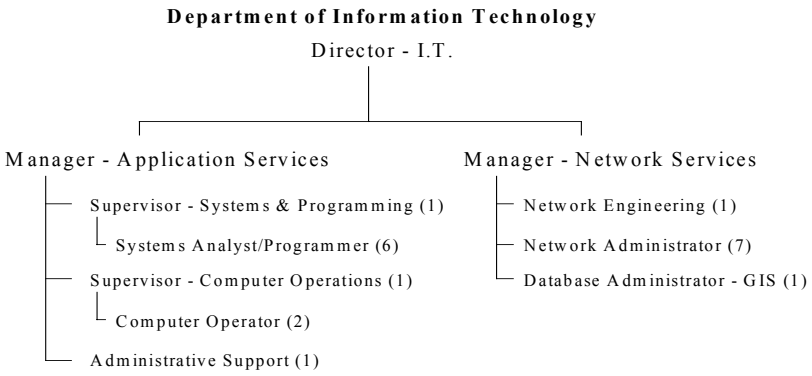
The process model depicted above serves as a basis for the Department of Information Technology's organizational structure and for the core services described in Section 3.1. The DIT is divided into two divisions, Application Services and Network Services, performing the above processes for all supported technology platforms.

Application Services: This division contains two distinct functional groups.

> ***Systems & Programming:*** This group performs the client engagement processes to understand and capture the technology requirements of specific business areas, and then builds or acquires the desired business applications. The group supports both enterprise-wide and department-specific applications.
>
> ***Computer Operations:*** This group operates and supports the applications deployed on the City's AS/400 computing platform. This group also provides hardware and operating system support for the platform, as well as security administration.

Network Services: This division provides the engineering and operational support of the City's networks. Disciplines include configuration management, fault management, change management, recovery management, performance management and capacity management. The network management scope includes the City's local area networks and the wide area network for the school system and the City. Also included is the infrastructure support for the Internet, GroupWare, e-mail, the Geographic Information System (GIS), the City's personal computers.

The organizational structure of DIT to provide these services is as follows:



3.3.3 Technology Management Teams

Five teams assist in the management of the delivery of information technology services to the City and in the management of certain enterprise systems.

Information Technology Leadership Team (ITLT): This team sets the direction and priorities for the use of technology across the City government. The ITLT is composed of representatives from each of the seven strategic areas and from the Constitutional offices supported by the City. This team also approves the technology infrastructure and standards utilized across all departments.

Web Team: This team sets the direction for the use of Internet technologies across the City government, including managing a consistent style and presentation of content. The Web Team is composed of representatives from each of the seven strategic areas. This team also recommends the technology standards utilized across all departments for Internet and Intranet development.

New World Systems Advisory Team (NWSAT): This team serves as a leadership team for the overall performance of one of the City's major software providers, New World Systems. Customer satisfaction and the prioritization of enhancements are the major focal points of this team. The NWSAT is composed of representatives from each of the departments with administrative responsibilities for a New World Systems application.

Geographic Information System Advisory Team (GISAT): This team serves as a leadership team for the management and operation of the City's Geographic Information System. The Department of Information Technology provides infrastructure support for this system, primarily server and network operations and database support. However, project management, data management, and application software support is provided by the City's Engineering Division in the Public Works Department. Customer satisfaction and the prioritization of enhancements are the major focal points for the team. The GISAT is composed of representatives from Engineering, Community Planning and Development, Assessor's Office and Department of Information Technology.

Local Area Network Administrators Team (LANAT): This team provides leadership for the direction of desktop and enterprise standards. In order for the networks to operate efficiently, effectively, and reliably, this team develops processes and procedures that exist across departments and organizations. The LANAT is composed of representatives from DIT as well as other City departments, schools and Constitutional offices.

3.4 Management Principles

Shared principles across all City organizations are a necessity for the most effective use of the City's technology resources. Nine fundamental principles, which have been endorsed by the City's Information Technology Leadership Team, are used to guide the City's information technology initiatives:

1. **Every technology initiative will have a defined business need and client sponsor.**
   - The business and operational needs as well as City leadership determine the technology priorities for the Department of Information Technology.
   - All technology initiatives will be driven by client requirements and prioritized according to the business need.

2. **Technology will be shared across departments and applied to common work processes wherever possible.**
   - Technology initiatives will have an enterprise-wide focus when being evaluated, looking for shared applications to reduce redundancy and the inefficient use of resources.

3. **Every technology initiative will be evaluated for its full requirements and costs, covering the full life cycle of the initiative, before a solution is developed and implemented.**
   - The full cost of an initiative, including the requirements for implementation, operations, maintenance and support will be included when being evaluated.

4. **Common data and data design will be used across departments to the fullest extent possible.**
   - Data will be viewed as a corporate resource.
   - Data will be captured once and shared wherever needed to reduce costs, redundancy, and duplication of effort.

5. **Custom application development will be minimized. "Buy" will be the preference versus "build."**
   - Commercial off-the-shelf software, with minimal customization, will be acquired and installed to speed the implementation of new business applications and to minimize application development resource requirements.

6. **Proven advanced technologies will be pursued.**
   - Technologies implemented will reflect emerging trends that meet business requirements, but will also have a proven track record for quality and support.

7. **Proprietary technology solutions will be minimized. Open architectures and standards will be followed.**
   - Technology solutions will adhere to open standards to facilitate data sharing and system integration, to minimize support costs, and to maintain maximum vendor independence.

8. **Technology initiatives will adhere to citywide technology standards.**
   - All information technology development and operations will conform to a defined Standard Development Environment (SDE) and Standard Operating Environment (SOE).
   - Standards will be maintained to minimize costs and to ensure systems interoperability.

9. **Technology projects will be managed using a standard project management methodology.**
   - All projects will have a predefined scope, with milestones and deliverables defined**.**
   - When vendors or contractors are utilized, contract management will be assigned and managed to ensure deliverables are produced within the agreed scope and schedule of the project.

All new technology initiatives will be evaluated and managed in accordance with these principles.

SECTION 4 -- INFORMATION TECHNOLOGY STRATEGIES AND INITIATIVES

4.1 Overview

The Department of Information Technology (DIT) primarily serves the departments of the City that provide services to the citizens and businesses of Lynchburg or to other departments internal to City government operations. Its mission is to provide its customers with the technology and services that will enable them to be successful.

Interviews were conducted in mid-2000 to identify each department's vision for how technology should be used in the next three to five years to improve their operations and the delivery of their services to the citizens of Lynchburg as well as internal customers. As a result of these interviews, seven enterprise-wide technology strategies were identified and are described in Section 4.2. These are areas of coordination that are required for the success of the business-driven initiatives that impact multiple departments. Section 4.3 contains the specific initiatives identified by each department during the interview process. Initiatives envisioned or planned for the improvement of the technical infrastructure are described in Section 4.4. These strategies and initiatives are listed regardless of funding or staffing constraints, and regardless of whether a cost/benefit analysis has yet been performed.

The Department of Information Technology also provides support to the community in certain technology-related areas, mainly related to telecommunications and cable television. Initiatives envisioned in these areas are described in Section 4.5.

4.2 City of Lynchburg's Enterprise Technology Strategies

The seven enterprise technology strategies identified in this section are derived from departmental plans to improve service delivery to the citizens through technology. These enterprise-wide strategies are required in order to assist departments in meeting their desired levels of service delivery.

4.2.1 Electronic Service Delivery (e-Government)

City services will be delivered, wherever possible, through electronic means such that a citizen or customer of those services does not have to come to City Hall or any other City location to receive the services. These services will also be made available 24 hours a day, seven days a week.

The primary delivery mechanisms will be through the Internet, interactive voice response systems, and strategically located public service kiosks. Software will be used to capture data and to provide the flow of electronic

forms and information between systems and departments. Significant benefits could be achieved through improvements to customer service, through faster process cycle times, and through the elimination of paper-driven processes.

4.2.2 Database Integration

Existing databases will be modified so that data can be accessed easily by electronic delivery mechanisms. This is a fundamental requirement in order to enable the e-Government strategy. Many of the City's existing systems and databases are not designed to readily share information. In order to enable the electronic delivery of services, legacy databases must be altered to allow for open access through the Internet, voice response systems, and kiosks. Also, any new systems must be designed such that their databases follow open-systems standards, enabling ready access to the information contained within these databases.

In addition, interface programs must be written to allow for the automated exchange and update of data between systems.

4.2.3 Electronic Document Management

Documents will be created and stored electronically wherever possible. Where source documents are not available in electronic format, an imaging system will be used to manage scanned documents to reduce physical storage requirements and to reduce costs. This strategy will also allow for improved responsiveness to customer requests for information through faster document retrieval, and enable improved workflow processes.

4.2.4 Voice System Enhancement

An integrated phone and voice mail system will be utilized between all City departments. Current voice systems are not integrated, and many are not sized to meet departments' customer service needs. An integrated system will improve customer service through reduced "hand-off's" of customer requests, since messages currently cannot be exchanged in an automated way. An additional benefit is the reduction in maintenance expense. Current systems are old and require more frequent and costly repairs.

4.2.5 Mobile Work Management

The information needed to deliver services and to manage work by departments with mobile work forces will be accessible to and from remote locations. Real-time interactive access to systems and data using mobile devices will be used where required. Where real-time data is not a necessity, portable data storage (using data stored on laptops and compact

discs) will be available to mobile workers. In addition, systems will be employed to provide real-time tracking of the location of City vehicles.

This strategy is required to enable productivity and customer service improvements of mobile workers in the areas of building inspections, property appraisal, police, fire, emergency medical response, utilities, and engineering.

4.2.6 Geographic Information System (GIS) Expansion and Integration

The City's Geographic Information System (GIS) will be treated as an enterprise resource, expanded to provide the data layers needed by many departments, and integrated with other systems to share data. Many departments have expressed the need to tap into the functionality of GIS to hold additional data layers, or to simply gain access to existing data layers. GIS is also an example of where the Data Integration strategy can be applied, developing automated interfaces to exchange data between systems.

4.2.7 Standardization of Real-time Business Systems

Core business systems will be deployed, including the full deployment of the applications contained in the New World Systems suite. This will enable the elimination of redundant financial business applications, as well as the elimination of many manual work processes.

4.3 Departmental Initiatives

Summarized below are initiatives that were identified by departments during the interview process. Initiatives are grouped by enterprise technology strategy and listed by time frame beginning with the upcoming budget year. Each summary includes a brief description, anticipated benefits, a funding source, if known, and an estimated time frame. As noted earlier, the initiatives are listed regardless of whether funding and staffing have been identified or are available, and regardless of whether a cost/benefit analysis has yet been performed.

4.3.1 Electronic Service Delivery (e-Government)

4.3.1.1 Airport

Description: Deploy a Multi-Use Flight Info System (a flight-monitoring system) and ultimately expand access to an Internet web site
Benefits: Will provide real-time flight information to customers
Funding: None allocated; Federal and State funded
Dates: FY2001–02 and FY2002-03

4.3.1.2 Assessor

Description: Display the land book and other components of property data on the web and provide access through a public access terminal or kiosk.
Benefits: Reduction in staff time and improved customer service through multiple means.
Funding: None allocated
Dates: FY2001-02

4.3.1.3 Budget Office

Description: Publish the Operating and Capital Improvement Program budgets on the Internet with query and comparison functionality
Benefits: To provide easily accessible budget information to citizens and reduce the staff time required in responding to requests for information
Funding: None allocated
Dates: FY2003-04

4.3.1.4 Citizens First Center

Description: Deploy an Interactive Voice Response (IVR) system
Benefits: Provide citizens with a way to communicate and request information from the Citizens First Center during all hours
Funding: None allocated
Date: FY2001-02

4.3.1.5 City Manager's Office

Description: Publish the City's strategic plan over the Internet, with links to other City documents and plans; provide the capability to capture reader comments online
Benefits: Will improve citizen access and citizen input to plans and documents
Funding: None allocated
Dates: FY2001-02

Description: Automate the process to develop and publish City Council reports with associated attachments online
Benefits: Will improve the flow of work, reduce the cycle time to produce reports, and reduce copying costs
Funding: None allocated
Dates: FY2001-02

Description: Develop a process to allow citizens to pay for and access City services from Fire Stations and other public access points
Benefits: Will provide citizens with more convenient access for transactions and services
Funding: None allocated
Dates: To be determined

4.3.1.6 Clerk of Council

Description: Develop a process for the City Council Agenda/Reports to be prepared and shared electronically with employees and City Council Members
Benefits: The elimination of redundant processes and a reduction in paper
Funding: None allocated
Dates: FY2001-02

4.3.1.7 Community Planning and Development

Description: Deploy a tool to accept and track development requests and plans from the point of request through the permits and inspections processes; provide remote access to the process and status information from the web, phone, and portable data devices
Benefits: Improved productivity, reduced cycle time of processes, and improved ability to provide more information to customers through multiple means
Funding: None allocated
Dates: FY2001-02

Description: Provide a public access terminal for basic property-related information through the GIS
Benefits: Staff time will be reduced while providing improved information access and convenience for the public
Funding: None allocated
Dates: FY2002-03

4.3.1.8 Engineering

Description: Place engineering design specifications on the Internet
Benefits: Improved service delivery to developers while decreasing maintenance time and expense
Funding: None allocated
Dates: To be determined

Description: Scan engineering drawings and make them and other digital CAD images available over the Internet
Benefits: Provides a reduction in file maintenance and retrieval tasks, and would prove useful in the automation of project management
Funding: None allocated
Dates: To be determined

4.3.1.9 Financial Services

Description: Replace all or part of any legacy system that cannot make use of the Internet for revenue collection, information dissemination, electronic bill presentation or other types of service delivery
Benefits: Customer service delivery will be improved by offering convenient methods to transact business
Funding: None allocated
Dates: To be determined

4.3.1.10 Fleet Services

Description: Locate computer work stations in each shop technician's work area
Benefits: Technicians will have quick access to up-to-date schematics, technical guides, and work orders, and have the ability to communicate with vendors
Funding: None allocated
Dates: FY2002-03

4.3.1.11 Human Resources

Description: Develop the ability for completing and submitting applications over the Internet, and link the applicant information to an applicant tracking database
Benefits: Applicants will have improved access and convenience in submitting employment applications, while reducing the redundancy of tracking employment applications and improving turnaround timeframes to the hiring department
Funding: Some funding available
Dates: FY2000-01 and FY2001-02

Description: Develop a process that allows employees access to an on-line, interactive employee benefit enrollment and maintenance application; interface with the current Human Resources Information System
Benefits: Employees will be able to take individual control of benefit enrollments and changes while eliminating work redundancy and improving processing time
Funding: None allocated
Dates: FY2002-03

Description: Develop an interactive application tracking system that allows an applicant to access status information through the Internet or by telephone
Benefits: Will reduce need for applicants to call the office and provide applicants easy access to information
Funding: None allocated
Dates: FY2001-02

4.3.1.12 Library and Museums

Description: The Gates Grant Initiative will provide 8 personal computers for public access to the Internet and possibly another 11 personal computers for public access and teaching capabilities for public or City use
Benefits: Improved public access and teaching capabilities
Funding: Private grant
Dates: FY2000-01 and FY2001-02

Description: Provide public access to systems through kiosks at locations through out the community to allow for payment of library fines with credit cards, access to electronic databases, and card catalog research
Benefits: Will provide additional convenience to citizens
Funding: None allocated
Dates: To be determined

4.3.1.13 Parks and Recreation

Description: Implement an online registration and payment process for parks and recreation programs
Benefits: Citizen access will be more convenient and staff time will be reduced
Funding: None allocated
Dates: FY2002-03

Description: Install personal computers with network connections for public access at all recreation centers
Benefits: Increased public access to the Internet and City services within neighborhoods, providing teaching labs for the public, and the capability for City workers to stop and connect to the network when in the field
Funding: None allocated
Dates: To be determined

4.3.1.14 Police and Emergency Communications

Description: Provide access to accident, crime, and other incident-related information and reports over the Internet
Benefits: Citizens will have quicker and more convenient access to information
Funding: None allocated
Dates: FY2002-03

4.3.1.15 Procurement

Description: Provide a web-hosted auction site for City surplus property and utilize electronic updating of asset and revenue accounts
Benefits: A reduction in staff time involved with preparing for auctions and with updating financial records upon completion
Funding: None allocated
Dates: FY2002-03

Description: Provide on-line vendor registration through the City's web site and interface the data to the AS400 vendor master file
Benefits: Will improve vendor relations and reduce level of staff work by having vendor provide commodity, tax and remittance information at the point of registration
Funding: None allocated
Dates: FY2002-3

4.3.2 Database Integration

4.3.2.1 Assessor

Description: Replace the Computer Assisted Mass Appraisal (CAMA) system; utilize digital photographs of properties and eliminate the paper version of property cards through imaging or creation of an electronic record
Benefits: Improved availability of property data to citizens and City staff
Funding: None allocated
Dates: FY2001-02

4.3.2.2 Commissioner of Revenue

Description: Link all billing and accounts receivable systems so that all monies owed by a citizen can be seen in one view
Benefits: Provide improved customer service and improved collectibles
Funding: None allocated
Dates: FY2001-02

4.3.3 Electronic Document Management

4.3.3.1 Budget Office

Description: Implement a software tool that enables budget information (text, numeric, and graphics) to be gathered and shared electronically and that generates a final document without re-keying information
Benefits: Redundant processes will be eliminated and staff time reduced significantly
Funding: None allocated
Dates: FY2003–04

4.3.3.2 Building & Grounds and Streets

Description: Either modify the existing work management system to maintain the inventory of custodial supplies or develop an interface between the work management system and the system currently used to maintain the custodial supply inventory
Benefits: Elimination of duplicate data entry in recording the usage of custodial supplies
Funding: None allocated
Dates: FY2002-03

4.3.3.3 City Attorney

Description: Deploy an imaging system to store records and documents
Benefits: Reduce storage space needs, improve customer service and greatly improve the ability to retrieve documents quickly
Funding: None allocated
Dates: FY2000-02

4.3.3.4 Commissioner of the Revenue

Description: Deploy an imaging system
Benefits: Will improve customer service, reduce staff time for document retrieval, and reduce storage space
Funding: None allocated
Dates: FY2001-02

4.3.3.5 Commonwealth's Attorney

Description: Deploy an imaging system to store and access documents currently in paper format
Benefits: Reduction in storage requirements for paper documents and easier access
Funding: None allocated
Dates: FY2001-02

4.3.3.6 Community Planning and Development

Description: Deploy an imaging system to scan and store plans, blueprints, and other documents associated with plans; integrate the system with the tool that is used to track development requests
Benefits: Improved staff productivity through reduced paper handling; reduced storage space needs; allow access to documents by multiple users
Funding: None allocated
Dates: FY2001-02

4.3.3.7 Financial Services

Description: Utilize electronic forms to process internal expense transfers, reimbursements, and other financial transactions
Benefits: Improved productivity and customer service
Funding: None allocated
Dates: To be determined

Description: Deploy imaging technologies for document processing and storage

Benefits: Reduced storage cost, improved productivity and customer service
Funding: None allocated
Dates: To be determined

4.3.3.8 Human Resources

Description: Deploy an imaging system that allows accurate, easily accessible document imaging and storage
Benefits: Reduced use of paper, reduced need for storage space, and convenient access to historical documents
Funding: None allocated
Dates: FY2002-03

Description: Develop a secure system that allows individual employees to access and update basic information that pertains to them in the HRIS such as address, phone number, dependents
Benefits: Will improve communications while increasing employee responsibility for maintenance of routine information; staff time will be reduced as redundant processes are eliminated
Funding: None allocated
Dates: FY2002-03

4.3.3.9 Library and Museums

Description: Deploy an imaging system in partnership with Jones Library
Benefits: Will improve access for retrieval of documents and photographs
Funding: Possible grant of $10,000 available, other funding undetermined
Dates: FY2001-02

4.3.3.10 Procurement

Description: Implement a tool to manage and organize text, spreadsheet and graphic information associated with bid documents, and integrate this information with bids currently being processed in the New World Systems Purchasing application module
Benefits: A reduction in staff time through the elimination of manually managing multiple documents and a reduction in potential errors or omissions
Funding: None allocated
Dates: FY2002-03

Description: Utilize electronic office supply order forms or corporate web sites specifically designed for the City through blanket/term contracts
Benefits: A reduction in office supplies costs and an improvement in the speed of the ordering process
Funding: None allocated
Dates: FY2003-04

4.3.3.11 Social Services

Description: Deploy imaging technology for document processing, retrieval, and storage
Benefits: Will provide reduced storage cost, improved document retrieval, and multiple user access from various locations
Funding: None allocated
Dates: FY2001-02

4.3.4 Voice System Enhancement

4.3.4.1 Citizens First Center

Description: Install an Automated Call Distribution (ACD) system and integrate with other call center operations
Benefit: Better management of call center operations and improved customer service; allow for routing of phone calls to multiple stations, increasing flexibility in sharing the call load and decreasing wait times; provides data on call volumes, wait times, number of on-holds, etc.
Funding: None allocated
Dates: FY2001-02

4.3.5 Mobile Work Management

4.3.5.1 Building, Grounds and Streets

Description: Expanded access for supervisory personnel to produce, manage, and update work orders generated through the Work Management System
Benefits: A reduction in paper work and quicker access to work order data
Funding: Some available
Dates: To be determined

4.3.5.2 Engineering

Description: Deploy laptop computers in field vehicles to enable access to work orders remotely
Benefits: More timely response to citizen requests
Funding: None allocated
Dates: To be determined

4.3.5.3 Fire Department

Description: Deploy laptop computers or mobile digital terminals in fire and EMS vehicles; approximately 20 - 25 devices
Benefits: Improved access to additional response information, including maps and pre-planning information, enhancing emergency operations and reducing the amount of redundant work in recording and providing run and patient reports
Funding: None allocated, although Lyncom is providing $8-10K this year for pilot of laptop computers
Dates: FY2002-03

Description: Install a global positioning system locator system in Fire and EMS vehicles with a display board at Lyncom
Benefits: Provide immediate information about equipment location and improve response times
Funding: None allocated
Dates: FY2002-03

4.3.5.4 Juvenile Services

Description: Utilize laptop or handheld devices in the field allowing for the access to information and the updating of case files
Benefits: Improved delivery of services and efficiency
Funding: None allocated
Dates: To be determined

4.3.5.5 Police and Emergency Communications

Description: Deploy laptop computers using the 800 MHz radio system in public safety vehicles and upgrade the gateway switch to expand capacity of deployment
Benefits: Utilize voiceless dispatch to reduce radio traffic and improve accuracy of dispatches; provide remote access to data for field units to improve productivity and responsiveness.
Funding: Pilot is currently funded; none allocated for gateway switch
Dates: FY2001-02

Description: Deploy wireless handheld data devices for officers in the field
Benefits: Will improve productivity and allow for faster access to required information
Funding: None allocated
Dates: FY2002-03

4.3.5.6 Social Services

Description: Utilize laptop computers for remote access to case files and client systems, and to record data during field visits
Benefits: Will allow for access to up-to-date information while conducting fieldwork; entering information on cases without having to return to the office will improve productivity
Funding: None allocated
Dates: To be determined

4.3.5.7 Waste Management

Description: Implement a mobile information system for garbage collection trucks to link to the GIS to utilize street maps; deploy a global positioning system and locate a traffic board at the administrative office to view real-time locations of trucks; this system would be used for both regular and bulk pickups
Benefits: This is needed as a planning and training tool and to provide route information to drivers and to prepare for automated pick-up which may be an element of the solid waste contract negotiations
Funding: None allocated
Dates: FY2002-03

Description: Develop a work management system that allows for a scheduling interface with Bulk and Brush scheduling through the Citizens First Center System; personnel would access the system remotely from the collection trucks to obtain their schedule and enter time and duration of pick-up
Benefits: Will improve efficiency and customer service
Funding: None allocated
Dates: FY2002-03

4.3.6 Geographic Information System (GIS) Expansion and Integration

4.3.6.1 Budget Office

Description: Integrate maps, possibly from GIS, with the planning and submission of CIP budget requests
Benefits: Provide better supporting information to enable better decision-making
Funding: None allocated
Dates: FY2003-04

4.3.6.2 Economic Development

Description: Deploy a site modeling tool and interface it to the City's GIS
Benefits: Will provide a 3-D simulation tool for development planning
Funding: None allocated
Dates: FY2001-02

Description: Gain access to and deploy the State GIS system
Benefits: Will provide a variety of information from across the state and assist in economic development activities
Funding: None allocated
Dates: To be determined, as access to system is not yet available

4.3.6.3 Engineering

Description: Provide businesses with access to GIS data via the Internet and other means
Benefits: Businesses, such as engineering firms, realtors, and developers, would like access to detailed GIS data, possibly at a fee
Funding: None allocated
Dates: To be determined

Description: Add a traffic data layer to GIS, including traffic counts, and make it available over Internet
Benefits: Improved customer service, as several public entities would like access to this data
Funding: None allocated
Dates: To be determined

Description: Use a global positioning system to link surveys to monuments and automate the data load into GIS
Benefits: Will provide more accurate and efficient measurements and surveys
Funding: None allocated
Dates: To be determined

4.3.6.4 Parks & Recreation

Description: Add additional layers to the GIS to allow for the capability of park development, management, planning, and facility inventory
Benefits: Improved planning and decision-making process and tracking of inventories
Funding: None allocated
Dates: FY2004-05

4.3.6.5 Police and Emergency Communications

Description: Develop interface to GIS to gain access to current information about streets, property, etc.
Benefits: Will improve productivity and responsiveness
Funding: None allocated
Dates: FY2002-03

4.3.6.6 Utilities

Description: Expand the current mapping system to become more customer-friendly for ease of use by Utilities personnel; add attributes such as age, depth, values, hydraulics, length, etc. and interface with the GIS to obtain map information
Benefits: Will enable field crews to use access real-time data from the job site thereby improving operations
Funding: None allocated
Dates: FY2001-02

Description: Input field services work orders to a database providing monthly reports on water taps, sewer taps, repairs on pipes, manholes, cleaning pipes, etc.; interface to the GIS for address information
Benefits: Will allow pipe selection for replacement based on the number of breaks, age and other related data; enable tap calculation, figure labor, material, equipment and accessory cost analysis
Funding: None allocated
Dates: FY2001-2002

4.3.7 Standardization of Real-time Business Systems

4.3.7.1 Building & Grounds and Streets

Description: Replace the current application (written using Paradox) used today in several Public Works divisions to record expenses and bill payments; either rely on the NWS financial applications or obtain a replacement system to the Paradox application
Benefits: Reduce outside vendor maintenance expense, improve reliability, and improve the quality of the system
Funding: None allocated
Dates: To be determined

4.3.7.2 City Manager's Office

Description: Develop an enterprise-wide project management system to communicate project status, schedule, and financials and integrate with CIP process
Benefits: Will improve accountability, performance evaluations, and status information on projects
Funding: None allocated
Dates: To be determined

4.3.7.3 Financial Services

Description: Upgrade Financial and Fixed Assets Systems to support GASB 34
Benefits: Regulatory compliance is mandatory
Funding: None allocated
Dates: FY2001-02 and FY2002-03

Description: Evaluate and possibly implement the NWS Project Accounting module
Benefits: Improved financial data through the ability to track costs by project
Funding: None allocated
Dates: FY2002-03

4.3.7.4 Internal Audit

Description: Expand capabilities to query the financial systems and produce customized reports by deploying standard query and report-writer tools
Benefits: Expand the ability to extract/download information from the system; data will be accessed in formats needed for specific audits thus allowing more timely performance of audits; enables the ability to perform periodic spot reviews of data
Funding: None allocated
Dates: FY2001-02

4.3.8 Other

4.3.8.1 Airport

Description: Deploy high-speed data access to airport facilities to replace existing ISDN connection and install wiring to the required City and tenant access points
Benefits: Will provide the availability for higher-speed data services, thus improving productivity; this may possibly be a revenue source from tenants
Funding: None allocated
Dates: FY2001-02

4.3.8.2 Building & Grounds and Streets

Description: Install dedicated network connections to major building environmental control systems to allow for central administration and remote programming capabilities
Benefits: Will enhance the ability to manage systems by reducing travel time and improving trouble-shooting capabilities
Funding: None allocated; will include cost as existing systems are replaced due to age
Dates: To be determined

4.3.8.3 City Attorney

Description: Provide a shared database of updated Virginia Code and case rulings, accessible by all attorneys in the office
Benefits: Provide the most up-to-date legal information in a timely manner
Funding: None allocated
Dates: FY2001-02

4.3.8.4 Commonwealth's Attorney

Description: Develop a workflow and case management system allowing for the automated movement of case-related information from arrest to disposition; would involve an integrated system connecting the Commonwealth Attorney, the Police Department, the Courts, Community Corrections, and the Regional Jail
Benefits: Improved productivity with cost savings to all of the agencies, and improved quality of case management
Funding: None allocated
Dates: FY2003-04

Description: Provide technology in courtrooms to assist in case scheduling and presentation of case material and information
Benefits: Improved effectiveness of scheduling and case presentations
Funding: None allocated
Dates: FY2002-03

4.3.8.5 Communications and Marketing

Description: Activate the government channel and establish a presence on cable television; create a communications channel to provide information to Lynchburg viewers about the City's services, activities and programs
Benefits: The establishment of a government channel would provide for additional programming including City Council Work Sessions, Board and Commission meetings, etc., and would provide in-house video capability
Funding: None allocated
Dates: FY2001-02

Description: Implement a fax on demand system to give anyone with a touch-tone phone and a fax machine instant access to documents, forms, etc.; this service provides immediate information 24 hours a day and 7 days a week
Benefits: Citizens will receive what they want, when they want it, without the added expense of printing or mailing costs
Funding: None allocated
Date: FY2001-02

4.3.8.6 Financial Services

Description: Implement centralized bill processing and payment
Benefits: Will provide timely vendor payments, improved accuracy of posting to the General Ledger, and enhanced cash management through planned payment schedules and discounts
Funding: None allocated
Dates: To be determined

4.3.8.7 Fire Department

Description: Extend fiber to stations 2, 4, 5, 7 and 8 and the ARFF (Airport) facility
Benefits: Will enhance ability to transfer data and information between stations and administration; data transfer speed will increase; all stations will have Internet access and it will allow use of applications that currently cannot be used by stations using dial-up; recurring charges for DSL and ISDN lines will be eliminated
Funding: None allocated
Dates: FY2002-03

Description: Provide an additional 115 Lotus Notes licenses to provide e-mail accounts for all Fire Department staff
Benefits: Information will be disseminated more efficiently and in a timely manner to the staff at 8 different locations throughout the City, while reducing the flow of paper
Funding: None allocated
Dates: FY2002-03

4.3.8.8 Internal Audit

Description: Purchase and implement a system to develop automated audit work papers
Benefits: A reduction in the preparation time of audits and provide a more efficient and cost effective manner to maintain and store documents
Funding: None allocated
Dates: FY2001-02

4.3.8.9 Juvenile Services

Description: Connect Crossroads House to the wide area network to allow for high-speed access
Benefits: Will allow for Internet access and quick access to data for developing a central intake function
Funding: None allocated
Dates: To be determined

4.3.8.10 Library and Museums

Description: Upgrade the Library Information Online (LION) system to a window's based-program and possibly integrate with NWS
Benefits: Will provide an up-to-date version, which is more user friendly, and will allow interface with kiosks
Funding: None allocated (City share of upgrade is $100,000 and colleges from surrounding area are responsible for the remainder)
Dates: FY2002-03

4.3.8.11 Public Works

Description: Expand current pilot to centrally monitor electric consumption at the Wastewater Treatment Plant and other facilities
Benefits: Will result in reduced electricity usage and expense
Funding: None allocated
Dates: To be determined

Description: Install a networked system to centrally manage the security systems and energy systems in the City's buildings
Benefits: Reduced cost for the services of outside vendors
Funding: None allocated
Dates: To be determined

4.3.8.12 Social Services

Description: Implement an integrated financial system (Harmony) for Social Services and integrate to NWS
Benefits: Will streamline the tracking of financial data
Funding: None allocated
Dates: FY2001-02

4.3.8.13 Traffic

Description: Link traffic signals with fiber optics and connect to a central server for management
Benefits: Better management of traffic flow and traffic information
Funding: None allocated
Dates: FY2001-02

Description: Install devices on traffic signals in the major traffic corridors to allow for preemption by emergency vehicles
Benefits: Allows for reduced traffic congestion for emergency vehicles and reduces the emergency response times
Funding: None allocated but could possibly use a VDOT safety grant
Dates: FY2002-03

Description: Install optical signal detection devices on traffic signals and manage centrally across the data network
Benefits: Reduced replacement costs due damage from road maintenance and improved efficiency
Funding: None allocated
Dates: FY2002-03

4.3.8.14 Utilities

Description: Complete telemetry for the Supervisory Control and Data Acquisition (SCADA) system and interface it to the GIS for map information
Benefit: Will allow information to be obtained and controlled remotely
Funding: None allocated
Dates: FY2001-02

Description: Use a radio frequency (RF) module, adaptable for current meters, to read meters and input information directly into a PC-based database
Benefit: Will allow all related information associated with meter operations and billings to be handled remotely
Funding: None allocated (Requesting $250, 000 through CIP to pilot for commercial accounts)
Dates**:** FY2001 through 2005

4.3.8.15 Waste Management

Description: Develop a database system to monitor illegal dumping activity; the database would be used to record complaints and to track historical information, including digital photographs of sites
Benefits: Will provide for better enforcement of ordinances governing illegal dumping
Funding: None allocated
Dates: FY2002 - 03

Description: Develop a tracking system to record the frequency, time and duration of emptying containers at contracted recycling centers
Benefits: This information will provide accurate performance data for cost/benefit analysis
Funding: None allocated
Dates: FY2002 - 03

4.4 Infrastructure Initiatives

Summarized below are several initiatives that have been identified for the current fiscal year to improve the information technology infrastructure and to enhance the operations of information systems. Each summary includes a brief description, anticipated benefits, the funding source, and a time frame for completion.

4.4.1 Lotus Notes R5 Upgrade

Description: Upgrade the server and PC clients to Lotus Notes release 5
Benefits: This upgrade provides improved search and navigation capabilities to the messaging and database applications improving productivity and communications between City employees, their vendors and citizens
Funding: $20,000 for upgraded hardware from General Fund operating budget; software purchased in FY99-00
Dates: FY2000-01

4.4.2 File/Print Server Upgrades

Description: Upgrade the server hardware for the FS1 and FS4 NetWare servers

Benefits: These two servers provide basic file and print services for most City Hall departments as well as Human Services. Current servers are out of warranty and the risk is high to continue on existing hardware because of parts unavailability, lack of support and potential long turnaround times in the event of a failure. Operating System will not be upgraded at this time.

Funding: $24,000 from General Fund operating budget

Dates: FY2000-01

4.4.3 Carter Glass Building Renovation

Description: Renovate unused space in the data center building to provide office space for the relocation of IT personnel

Benefits: This renovation will allow for the people, equipment, and work processes associated with network operations to be co-located, resulting in improved productivity, security, and environmental control

Funding: $100,000 from the Capital Improvement Program

Dates: FY2000-01

4.4.4 Network Operations Center Relocation to Carter Glass Building

Description: Consolidate fragmented server operations to one central location

Benefits: By moving the network backbone and server equipment to the computer room in the Carter Glass building, reliability and manageability of the servers and networks will be improved

Funding: Primarily funded as part of the Carter Glass Building Renovation project, but additional funds may come from General Fund operating budget or Technology Fund

Dates: FY2000-01

4.4.5 Migration to Laser Print

Description: Migrate all possible printing in the data center from impact printers to laser printers.

Benefits: This will allow for greater flexibility for printed output, as well as reduce maintenance and equipment costs

Funding: $50,000 from the Technology Fund

Dates: FY2000-01

4.4.6 Network Hardware Upgrade

Description: Replace the network infrastructure with higher bandwidth equipment

Benefits: With the fiber optic investment made in the late 1990's, only the electronics have to be replaced to alleviate network traffic congestion across the networks connecting 50 City and School facilities

Funding: $260,000 from the Technology Fund, but not approved at this time

Dates: FY2001-02

4.4.7 City Hall Wiring Upgrade

Description: Upgrade network wiring in City Hall to category 5e wiring

Benefits: With many offices wired with category 3 and older wiring, this upgrade will allow higher performance functionality with the hardware upgrade

Funding: $62,000 from the Technology Fund, not approved at this time

Dates: FY2000-01

4.4.8 Internet Access Upgrade

Description: Increase the existing Internet T1 access with another T1 circuit

Benefits: Relief from congested Internet performance during business hours due to growth in City and School use

Funding: $15,000 from General Fund operating budget, with some portion possibly shared by Schools

Dates: FY2000-01

4.4.9 RADIUS Implementation

Description: Install RADIUS server and software for dial-up users of the City's network

Benefits: Simplification of access for users with user accounts and passwords synchronized with NetWare passwords

Funding: $10,000 from General Fund operating budget

Dates: FY2000-01

4.5 Technology in the Community

4.5.1 Network Strategic Partner

On September 15, 2000, the City entered into an agreement with CFW Communications (now known as Ntelos) as mutual strategic partners. Ownership of the 42 miles of fiber optic cable that interconnects the City facilities, public library, the public school system, and certain contractors for network purposes was transferred from the City to Ntelos. The intent of the

City was to leverage the network for all residents, businesses, educational institutions, health care providers, and other members of the Lynchburg community to obtain prompt and affordable access to advanced communication services of all kinds, and to promote robust competition in all communication services. Ntelos was selected as the best company to meet the City's vision.

In exchange for the value of the network, Ntelos will provide support for the existing fiber optic plant and continue to expand it, building on the infrastructure pioneered by the City. The City will receive lower costs for Centrex (phone) services, ISDN and analog phone lines, data circuits for remote access to the network and to the Internet, cell phones, and pager accounts.

To address some of the issues of those who do not have access to the Internet and school resources after hours (sometimes referred to as one aspect of the "digital divide"), Ntelos will provide network connections for three community centers with after-school programs in the coming year. Each year, additional centers will be serviced, up to a total of 18.

Fiber or high-speed network connectivity such as Digital Subscriber Line (DSL) or frame relay will be extended to eight additional City locations. To enhance economic development, the fiber will also be extended to seven industrial parks. Engineering and consulting of 1,000 hours/year will also be provided to be used for improvements to all telecommunication services used by the City and Schools.

4.5.2 Telecommunications and Cable Television Franchises and Ordinances

As part of the City's effort to help facilitate the availability of advanced telecommunications services to the community, the Department of Information Technology administers the franchises and ordinances required to manage the use of the public right-of-way by the providers of these services. Due to the convergence of data, video, cable television, and other telecommunications technologies -- all being provided over similar infrastructures occupying the public right-of-way -- coordination is essential to ensure the most effective use of the public right-of-way. It is also the City's goal, through the coordinated management of all telecommunications-related franchises, to hasten the availability of these services to the community.

Currently, the City has at least two providers of local voice and data services to the community through telecommunications franchises. It also has one cable television provider, with data and Internet services potentially being provided. Through the agreement with the City's network strategic partner described in Section 4.5.1, capacity is reserved on the network to allow for an

additional cable television provider, if one wishes to provide service in Lynchburg.

SECTION 5 -- INFORMATION TECHNOLOGY ARCHITECTURE

5.1 Overview

This section describes the current architectures for the City's Application, Data, Computing, and Network environments. These architectures describe the City's standards and provide the framework for future growth and enhancements to the City's technology infrastructure.

5.2 Application and Data Architecture

The Application architecture defines how applications are designed and developed and how they inter-operate to serve business needs. The architecture promotes the use of shared systems and shared data, as described in a corporate data model. The application architecture should be derived from the business process model for the enterprise, where applications are directly aligned to specific business processes and activities to deliver timely, cost-effective functionality. Application development standards are also part of the architecture. These standards drive a common look and feel to the user interface as well as reduced application development and maintenance costs.

Neither an application architecture mapping the City's applications to its business processes nor a corporate data model have yet been developed. However, standards for application development have been identified and are described in Section 5.5. Some major examples of application components that make up the City's application architecture are described below:

Business Systems: The City primarily relies upon a suite of software applications from New World Systems, Inc. to provide the application functionality for its core business systems, including general ledger, procurement, accounts payable, and human resources. These applications are centrally processed, with business rules that drive decentralized business processes.

Departmental Systems: Several in-house written applications are utilized for revenue collection, billing, and other revenue-related or departmental processes. Some of these applications are old and are candidates for replacement. Where significant enhancement or replacement of these legacy applications is warranted, the strategic direction is to utilize commercial off-the-shelf (COTS) products or, when internal development is required, to develop the applications in either Lotus Notes or Cobol.

Office Systems: The Microsoft Office suite of office automation software is utilized across the City on standard, LAN-based personal computers for word processing, spreadsheet, and presentation requirements. Lotus Notes is used City-wide as the standard for email, calendar, and workflow functionality.

Geographic Information System (GIS): The City's GIS is an enterprise system used to provide mapping and associated data layer functionality for a variety of data elements. It is built using a combination of products from two primary vendors, Intergraph and Oracle. Data layers will continue to be expanded in GIS over time. Access to GIS, primarily through web-based technologies, will continue to be expanded to internal City departments and to the public.

5.3 Computing Architecture

The computing architecture, sometimes referred to as the technology environment or the platform architecture, describes the hardware and operating system software used to operate application software. It includes any mainframes, mid-range computers, servers, workstations, and personal computers used in the enterprise. Standards for several of these platforms have been defined and are described in Section 5.5. The following is a brief description of each platform:

Mainframe and Mid-Range Computing: The City does not make use of any mainframe computers. An IBM AS/400 mid-range-computing platform using the OS400 operating system supports most of the City's core business systems and several departmental systems. The primary database management system for this platform is IBM's DB2. Currently, the City operates one AS/400 model 730 for production processing and one AS/400 model 720 for testing and development purposes.

The Police Department also operates a HP3000 Series 929KS mid-range computer using the MPE/ix version 6.0 operating system. This is used primarily to support complex crime analysis and for various work management and scheduling applications.

Servers: The City operates several Intel-based servers operating either Novell NetWare or Microsoft Windows NT. The Novell servers are used primarily for file and print sharing, while several Windows NT servers are used for application-specific purposes or for certain network, Internet, and GroupWare functions.

Personal Computers and Workstations: The City uses approximately 700 personal computers and workstations, primarily supporting standard office automation functionality. Standard desktop configurations are based on the Intel chip, operating either the Windows NT or Windows98 operating system. Most personal computers are connected to local area networks (LAN) for print and file sharing, as well as for access to email, the Internet, and applications based on servers or the mid-range platform. The standards for a typical configuration for office use are described in Section 5.5.

5.4 Network Architecture

Network Architecture defines a common, uniform network infrastructure providing reliable and ubiquitous communications for the City's distributed information-processing environment.

The Network Architecture specifies how information processing resources are interconnected, and documents the standards for protocols (for network access and communication), topology (design of how devices are connected together), and wiring (physical medium or wireless assignments).

The Network Architecture defines a unified, high-speed City-wide network based on open systems standards. The most significant benefit to a City-wide network solution is the ability to efficiently share information-processing resources across the enterprise. Sharing resources is a common theme in all aspects of the City's network infrastructure because economies of scale and efficiencies in operation result from collaborative approaches to technology. When departments share common application services and data, they avoid duplicative efforts and costs. The key to successfully sharing these resources is a network connecting all City departments together in a way that reduces redundancy.

A citywide telecommunications network must be strategically planned, strongly backed, and expertly managed. This network must:

- Utilize standard communication protocols.
- Sustain and support high capacity and high performance communication.
- Be scaleable, reliable, and extensible.
- Provide a variety of advanced telecommunications functions.
- Smoothly integrate with other private and public communication networks.

The computing industry has been going through an evolution. In the early years, a centralized processing environment would use a single-footprint large mainframe with a network of dumb terminals for access. Over time, as the capability and capacity of computers has improved, the trend has been to distribute the processing workload over multiple computers at multiple sites. The first step in this trend was the minicomputer environment where smaller versions of the mainframes provided localized networks for dumb terminals. Then, with the development of the personal computer, processing capability was distributed all the way to the desktop. Although such desktop capacity provided extreme flexibility and responsiveness, there were limitations. It was troublesome to share data. Users and business units could not function in an interactive manner across the technology platform. To address these limitations, the concept of a local area network (LAN) evolved. A LAN allows multiple computers, printers, and peripherals to be interconnected and to function as a shared computing environment. Thus, the term computer has grown to imply more than a single

personal computer or even mainframe. Instead the term computer may be used to refer to the entire collective group of networked computers, PC's, mainframes, workstations, and network servers, working together to provide a single information infrastructure. Within this new "computer", applications are distributed so the processing power is shared among several machines.

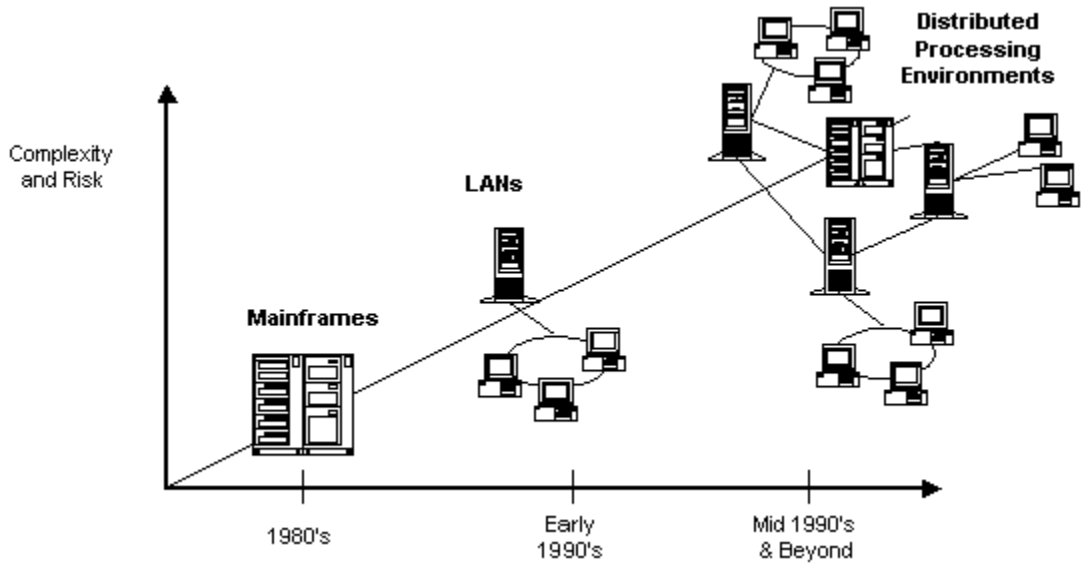


Figure 5.1 Changes in Network Environment

The following types of networks are discussed in this section:

- **Local Area Networks (LAN):** A data communications system of multiple interconnected data terminals, computers, or devices confined to a limited geographic area consisting of a single building, a cluster of buildings, or a campus type of arrangement. The network does not use common-carrier circuits, although it may have gateways or bridges to other public or private networks.

- **Wide Area Network (WAN):** A data communications system that serves a large geographic area. WANs are often implemented using common-carrier provided lines. A WAN typically serves as a customized communication "backbone" that interconnects all of an organization's local networks with communications trunks designed to be appropriate for anticipated communication rates and volumes between nodes. The existence of a WAN permits the deployment of file, print, or application servers across the infrastructure to create centrally managed LANs where the close proximity of components is no longer a requirement. The City of Lynchburg's network provides WAN functionality for it's governmental departments as well as the City Schools.

- **Internet:** A limitless collection of interconnected LANs and standalone computers working in a cooperative manner under the standards and guidelines of the Internet Society.

- **Intranet:** A limited collection of interconnected LANs and standalone computers. An Intranet functions the same as the Internet, using the same user interfaces and file transfer protocols. The difference between an Internet and an Intranet is that an Intranet provides connectivity between specific sites in order to create a pre-determined infrastructure for business units, customers, or designated participants. An Intranet is often protected from outside access by a firewall. A firewall typically consists of a router with packet screening and/or application filtering ability that can block traffic between networks or specific host computers.

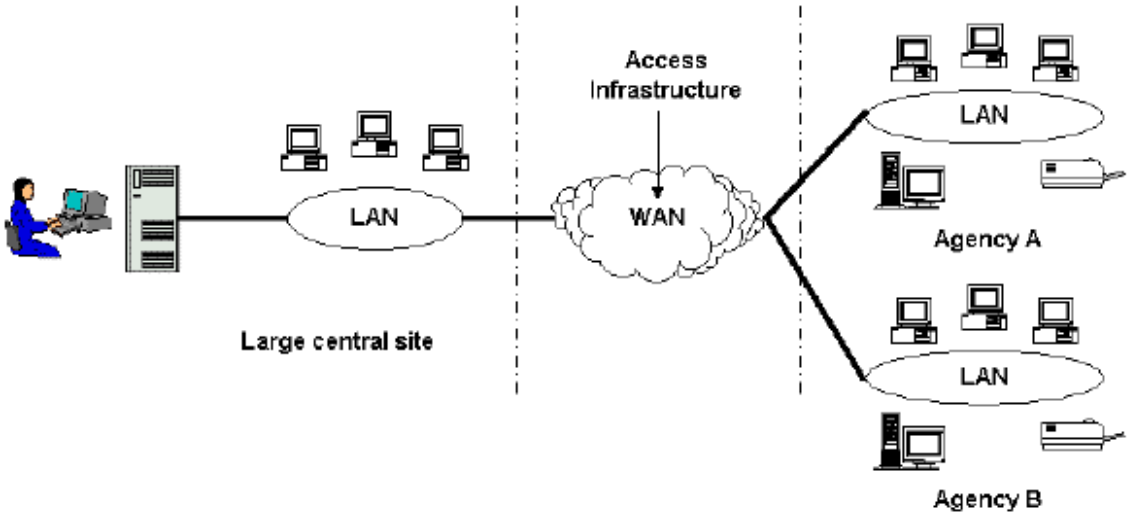


Figure 3-2. Typical network architecture.

LANs support the needs of individual workgroups or individual departments, but WANs support the cooperative and collaborative functions within the corporation or enterprise. Business requirements will necessitate using a variety of applications on the networks. However, the same need for variety does not exist within the network infrastructure. A uniform network architecture will enable LANs within the WAN to interoperate while allowing a broad platform on which to run applications as needed. Such interoperability requires cooperation at all departmental levels and consistency in network components (e.g., wiring, hubs, servers, operating systems, and protocols), management practices, and services. The LAN and WAN sections of this section specify how this has been and will continue to be accomplished.

Note: Additional information about Wireless Networking, Inter/Intranet, Voice Services, and Video Network Services will be added to this section in future releases.

Principles

The following principles are provided to guide the planning, design, and selection of network technology and services.

Principle 1: The network provides a communications infrastructure for distributed computing.

Rationale:

- The world is increasingly connected. A network environment provides access to a wide spectrum of information, applications, and resources.
- Any product or application not designed for a networked environment is limited long-term.
- The network provides the delivery mechanism for distributed services in an n-tier architecture.

Principle 2: A single integrated wide area network (WAN) is the backbone of an enterprise architecture and supports a variety of communication requirements including voice, data, image, and video.

Rationale:

- It allows access to a wide spectrum of information, application and system resources regardless of location or business unit. Thus, access to resources can be obtained in a timely and efficient manner by appropriate requesters when and where needed throughout the enterprise.
- It expands the scope of an organization domain by allowing them to reach out to customers and suppliers through access to the Internet and through the provision of dial-in/dial-out services.
- It acts as the delivery mechanism for the distributed computing services required by the fast-paced, dynamic business.

Principle 3: Networks should be available seven days a week and twenty-four hours a day.

Rationale:

- Networks provide an increasingly important and necessary role in the execution of business functions and processes. The availability of the network seven days a week and twenty-four hours a day must be maintained in a consistent and complete manner.
- Networks consist of and rely on many interrelated and often highly complex components distributed across a wide geographic area. Failure of any single component can have severe adverse effects on one or more business applications or services.
- Reliable networks contain no single point of failure. Networks are comprised of many components, and are only as reliable as the weakest link. Reliability must be built-in, not added-on.

- Bandwidth must be sufficient to accommodate new and expanding applications, different types of data (e.g., voice, data, image, and video), and a variety of concurrent users.
- The network must support software distribution and installation to a widely dispersed user community.
- The network must be designed to minimize latency. Data must pass across the network in a timely manner so that business decisions can be based on up-to-date information.

Principle 4: The City's network must be based on common, open, vendor-neutral protocols.

Rationale:

- An open, vendor-neutral protocol provides the flexibility and consistency that allows departments to respond more quickly to changing business requirements.
- An open, vendor-neutral network allows the City to choose from a variety of sources and select the most economical network solution without impacting applications.
- This approach supports economic and implementation flexibility because technology components can be purchased from many vendors. This insulates the City from unexpected changes in vendor strategies and capabilities.
- Applications should be designed to be transport-independent.

Principle 5: User access should be a function of authentication and authorization, not of location.

Rationale:

- All users must obtain authentication via a user identification method consistent with the standards and usage guidelines set by the enterprise.
- Authorization of users must be performed according to the security rules of the enterprise and the local business unit.
- In order to perform their job functions, users need to access services available from multiple sites within the enterprise, from a variety of public and private networks, and from the Internet.

5.5 Information Technology Standards

The table on the following pages describes the current technology standards for the City's Application, Data, Computing, and Network environments. These standards are reviewed periodically and updated as required.

INFORMATION TECHNOLOGY STANDARDS

PERSONAL COMPUTERS	
Operating System	Microsoft Windows 98 Second Edition or Windows NT 4.0
Productivity Applications	Microsoft Office 97 Standard
E-mail/GroupWare	Lotus Notes 4.65 migrating to Notes 5.0
Antivirus	Symantec's Norton Antivirus Version 5.3
Web Browser	Microsoft Internet Explorer Version 5
Desktop Hardware	Dell or Gateway Pentium III 600 MHz 128MB RAM non-ECC 10GB hard drive 1.44MB floppy drive 24X CD-ROM drive 17" Monitor No modem Standard Speaker Card and Speakers 4MB Video Card (8MB recommended) Standard 101 Keyboard and 2 Button Mouse 1 PCI or ISA Slot available 1USB port 3 Year on-site service warranty
Laptop Hardware	IBM or Dell Pentium III 450 MHz 128MB RAM 6GB hard drive 1.44 floppy drive * 24X CD-ROM drive * 14.1 TFT active matrix screen 56K modem ** 10/100 Network interface card ** 4MB Video memory 3Year on-site service warranty *must have capability to use both floppy and CD simultaneously ** Recommend with all in one "combo" card
Personal Digital Assistants	Palm Pilot IIIe with EasySync Version 3
SERVERS	
Data Base Management Systems	Notes, Oracle or SQL Server
Hardware	Intel-based
Operating System	Novell and Windows NT

INFORMATION TECHNOLOGY STANDARDS	
MIDRANGE	
Database Management Systems	DB2
Hardware	IBM AS400 model 730 (production) and model 720 (development and testing)
Operating System	OS400 4.4
DEVELOPMENT TOOLS	
Web Publishing	Microsoft FrontPage
Web Server	Microsoft IIS Server (NT 4.0) for Lotus Domino
PC Development	Lotus Notes Designer and Microsoft Visual Studio
AS/400 Development	Cobol/400, RPG/400, IBM Advanced Function Printing and Application Development Toolset/400